

## CHAPTER 3

# NETWORK TROUBLESHOOTING

*Upon completing this chapter, you should be able to do the following:*

- *Describe how to diagnose and isolate problems with LANs.*
  - *Describe how to troubleshoot network malfunctions.*
  - *Explain how to test and evaluate the connection of networking system nodes.*
  - *Explain how to troubleshoot communications line problems.*
- 

With any network system, you should have a set of error procedures for personnel to follow to handle errors or malfunctions on the system. These error procedures are the steps to be taken when the system is not operating properly. They are different from the error-detection and diagnostic procedures used to isolate and correct transmission problems.

A complete set of diagnostic procedures is necessary for the system. The system procedures are used to isolate the problem to the system or subsystem level. Since the facilities of a network may not be in the local area, it is necessary to have a set of test software and equipment with replacement components available for diagnosing and correcting problems.

### TROUBLESHOOTING LANS

As a communications specialist, more than likely you will be expected to know how to troubleshoot problems on LANs. As a troubleshooter, you must be able to identify a wide range of network problems relating to hardware (the data terminal equipment, the communications link, repeaters, gateways, and so on), software (network operating system, applications, and soon), and peopleware (the end user). It will be your job to identify, isolate, and resolve both the simple and complex problems.

### DIAGNOSTIC TOOLS

Normally, a problem can be solved without too much difficulty with the help of diagnostic tools. The best diagnostic tool available is accurate documentation. This documentation should include:

- Workstation and server configurations
- All network related software and equipment
- Location and paths of all wiring
- Updated records of all equipment and configurations changes

With documentation in hand, along with the help of diagnostic software (a network management package or a LAN analyzer), and specialized diagnostic equipment, such as a datascope, a time domain reflectometer (TDR), or a breakout box, the job becomes routine.

Classifying the problems and taking the necessary actions to resolve them are an important part of your job as a troubleshooter. However, it is equally important to remember to log all problems according to your activity's procedures. This will identify recurring problems, provide information for long term solutions, and enhance your command's training program.

### ISOLATING PROBLEMS

When isolating a problem, consider the three major areas we discussed earlier—the user, the software, and the hardware, usually in that order. The majority of all network-related problems are caused by the user's actions—operator errors. Users either do not understand how to operate their PC in a networking environment or they are unfamiliar with the application software package they are using. Most of the time you will find yourself responding to user problems and complaints. A user will call, saying such things as the following:

- My terminal/PC is hung up, and I cannot get into the system.
- My terminal/PC screen suddenly went blank.
- My terminal/PC keeps coming up with the same error message.
- My terminal/PC will not allow me to access the disk file.
- My terminal/PC will not print.

It will be your job to determine if the problem is user, software, or hardware related. Whenever you receive a call about a problem, obtain as much information as possible about the person and the problem. Ask the user's name, phone number, the terminal/PC or node identification number, the nature of the problem, and what, if anything, occurred immediately preceding the problem. In addition, you should ask the user what application he or she was trying to access or currently working with at the time the problem occurred. Ask whether other users are experiencing the same or similar problem, did any error messages appear on the screen, and be sure to ask whether the PC was moved before the problem occurred. Sometimes moving hardware creates problems—the connector cable may not be seated properly.

Once you have received initial information about a problem, it should help you to categorize the problem. Keep in mind most problems are the result of inexperienced users/operators. Because so many different types of errors can occur, it would be impossible for us to list them all, along with the necessary steps to resolve them. However, based on past experiences, we can provide you with some helpful hints and guidelines to follow. If the problem seems to be isolated to one user, it is probably user error; if the problem occurs with a group of users in a common geographic location, the problem is usually related to the cable; and if the problem is network wide, a close look at the network software is in order. Let us take a look at some of the more common problems that frequently occur and their solutions in connection with these three categories.

PO3 Frost has just called to report he cannot log on to the LAN. You begin solving the problem by asking some preliminary questions. You find this is the first time PO3 Frost has used the LAN and no one else in his area is experiencing any problems. At this point, you should be able to recognize the problem is more than

likely the result of an inexperienced operator (user error). The logical corrective action to take is to walk PO3 Frost through the proper log-on procedures and password security requirements. He follows your instructions and successfully logs onto the LAN. PO3 Frost should have been able to log onto the LAN by following the User's Guide on LAN operations. You might want to review the guide to make sure it is current and available to all users.

A few weeks later PO3 Frost calls again and reports he has been having intermittent problems while logged on to the LAN. Sometimes while he is saving or retrieving data, his machine locks up for no apparent reason. Again, no one in his immediate work area is experiencing problems. After obtaining all the pertinent information available, you believe the problem is faulty hardware. During the save and retrieve operations, a packet is generated and sent through the network interface card, onto the cable, and to its destination. So the two most logical components to check are the cable connections and the network interface card. The diagnostic tools to use are the time domain reflectometer (TDR) to check any breaks on the cable and the diagnostics that come with the interface card. PO3 Frost runs the card diagnostics at the terminal while you check the cable continuity. The network card passes the test, but the TDR detects a continuity break near his location. A LAN technician checks the connectors at the workstation and discovers one of the connectors has worked itself loose. After replacing the connector, the cable is tested again and passes. PO3 Frost logs on to the LAN and experiences no further problems. In this example we eliminated the cable itself because no other user on the cable segment was experiencing problems. Had there been other users also experiencing intermittent failures, then the cable would have immediately been our focal point of testing, since this is the commonality between the users.

You arrive at work Tuesday morning and find a stack of messages waiting for you from users experiencing problems while trying to access the word processing program on the LAN. The only thing these users have in common is they all use the same file server. Immediately you focus your attention on the network operating system and software. You call PO3 Door to ask her a few questions before you begin troubleshooting any further. You learn PO3 Door is able to access all application programs on the LAN with the exception of the word processing program. You immediately log on to the network management program and monitor the data traffic. You discover no user has used the word processing program since

Monday at 1600. The only person authorized to use the LAN after 1600 is PO1 Brush, who is the network administrator. You call PO1 Brush and ask if any changes were made to the word processing program since yesterday. PO1 Brush states he installed a new version of the word processing program on Monday around 2200 to eliminate any work disruptions. You ask him to check the security access to this new version. You find PO1 Brush inadvertently restricted all users from accessing the new version of the word processing program after he removed the old one. He makes the necessary access changes, and everybody is once again happy and able to use the new version.

As you can see, there is a pattern to the various types of errors/problems you will encounter. The problems you will be confronted with will range from the simple to the disastrous. They may be user/operator errors, software problems, or hardware malfunctions. Knowing which is sometimes easy. Under other conditions, it may be difficult for you to determine the source of the problem. The important thing is to learn from your past experiences. Keep a list of symptoms, probable causes, and ways you can use to trace a problem to its cause. This will assist you in diagnosing and troubleshooting problems. You will also find users have a tendency to make the same mistakes again and again, especially while they are learning. You can provide them a great service by explaining some of the more common problems they are likely to encounter, the reasons for the problems, and ways to avoid having them happen to them.

## **NETWORK MALFUNCTIONS**

Any malfunction of the network is going to result in a nonavailability of the system to the users. The diagnosis and fixing of this malfunction becomes a high priority. There are three primary culprits to network malfunctions: component and server failures, and data collisions.

### **COMPONENT FAILURE**

Component failures are categorized in two categories: hard faults and soft faults. Hard faults are relatively easy to find, and a diagnostic program will diagnose them correctly every time. Soft faults can be difficult to find, because they occur sporadically or only under specific circumstances, rather than every time the memory location is tested. A diagnostic program tests computer hardware and peripheral devices for correct operation.

Most computers run a simple set of system checks when the computer is turned on. The PC tests are stored in read-only memory (ROM), and are known as power-on self tests (POSTs). If a POST detects an error condition, the computer will stop and display an error on the screen. Some computers will emit a beep signal to indicate the type of error.

One of the best tools to use for network malfunctions is a network analyzer. A network analyzer is a product that can be used to monitor the activity of a network and the stations on it, and to provide daily summaries or long-term trends of network usage and performance. A network analyzer can do tasks such as:

- Count or filter network traffic.
- Analyze network activity involving specified protocols or frame structures.
- Generate, display, and print statistics about network activity, either as they are being generated or in summary form.
- Send alarms to a network supervisor or network management program if any of the statistics being monitored exceeds predetermined limits.
- Do trend or pattern analyses of network activity.

Network analyzers may be software only or consist of both software and hardware. The latter may include an interface card enabling you to test the network directly. This card may include an on-board processor. Because of their greater capabilities, hardware/software analyzers are more expensive than the software only analyzers. In fact, the prices for the hardware/software analyzers can be several times as high as those for the software only versions.

### **SERVER FAILURE**

The most obvious sign that the server has failed for some reason is that all users, except root, will not be able to logon to the system. Use the following steps as required to reestablish services:

- The first and easiest thing to try is to run the system distribution again. This will rebuild the system maps if nothing else is wrong and will allow users access to the system.
- Shutdown and reboot the system. During the boot process ensure that no failures occur on any of the nodes.

- Verify the domain name.
- Look for the maps subdirectory; it should be the same as the domain name. If it is not there, you will need to run the system initialization command.
- If the above fails, ensure that all the files to be mapped are present on the server. If any have been deleted, they will have to be restored from the latest system saves.

One of the best ways to avoid server malfunctions is to conduct maintenance on the server. It is important to set up a schedule for your server and strictly adhere to it. To check the hardware, you should do at least the following things:

- Clean the server carefully but thoroughly.
- Check cabling and connections for tightness and signs of bending or stress. Do not disconnect connectors unless necessary, since many connectors are rated for a limited number of matings.
- If possible, check the cabling with a line analyzer.
- Run thorough diagnostics on the storage medium and on other system components to identify the components that are likely to fail and to deal with these before they actually do fail.
- Check the quality of your power line by using a line tester.

The hardest part of server maintenance is finding the time to conduct the maintenance, since the network will have to be offline to conduct. In many cases, server maintenance will need to be during off peak hours, late night or early morning, when there is little or no use.

## DATA COLLISIONS

A data collision is the simultaneous presence of signals from two nodes on the network. A collision can occur when two nodes each think the network is idle and both start transmitting at the same time. Both packets involved in a collision are broken into fragments and must be retransmitted.

### Collision Detection

To detect for a collision, nodes check the dc voltage on the line. A voltage level of two or more times higher

than expected indicates a collision, since this means there are multiple signals traveling along the backbone at the same time.

In a CSMA/CD (carrier sense multiple access with collision detection) systems, all workstations or nodes attached to the network monitor the transmission medium at all times. When a node needs to send data, it waits until the line is quiet and then transmits. If two or more nodes happen to transmit data at the same instant, a collision occurs. Each node detects the collision and then waits for a variable amount of time (as programmed in the NIC's microprocessor) before testing the bus again and retransmitting. Since each node waits for a different amount of time, say 10/1000 and 20/1000 of a second, it is very unlikely that the collision will occur a second time. The CSMA/CD detection method is further illustrated in figure 3-1.

### Collision Avoidance

To avoid collisions, nodes can send special signals that indicate a line is being used for a transmission. In a

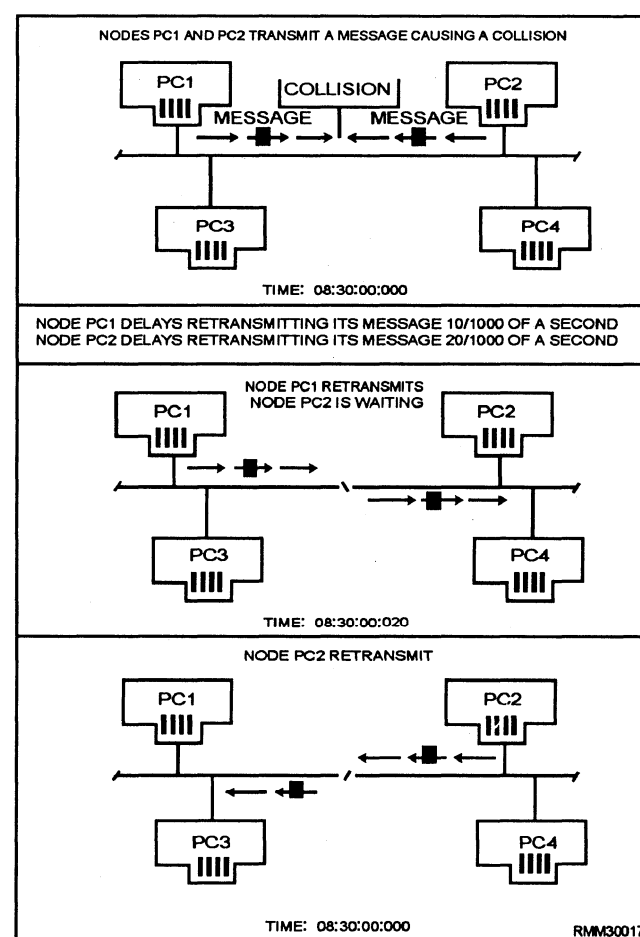


Figure 3-1.—A bus network using the CSMA/CD access method.

CSMA/CA (carrier sense multiple access with collision avoidance) system, the media-access method uses RTS (ready to send) and CTS (clear to send) signals before sending a frame onto the network. A node transmits only after the node has requested access to the line and access has been granted. Other nodes will be aware of the RTS/CTS transmission and will not try to transmit at the same time.

**RTS.**— A hardware signal sent from a potential transmitter to a destination to indicate that the transmitter wishes to begin a transmission. If the receiver is ready, it sends a CTS signal in return.

**CTS.**— A hardware signal sent from a receiver to a transmitter to indicate that the transmitter can begin sending. ACTS signal is generally sent in response to an RTS signal from the transmitter.

## NETWORK SYSTEM CONNECTIONS

The testing and evaluation of network connections is accomplished with the same test equipment that is used to test network components. This equipment includes voltmeters, ammeters, volt-ohm-milliammeters, and line scanners. All of this test equipment checks the voltage, resistance, and current that passes through the cable and the connectors between the network nodes. Any increase or decrease in voltage or current or an increase in the resistance will cause communications problems for the users.

Whether the cable is pre-made or you make it, you should always test the cable before it installed into the network. This will alleviate the possibility of installing a bad cable or connector to the system. Any time that you can detect a bad connector will be to your advantage, since each connector has a limited number of connections before it has to be replaced.

## COMMUNICATION LINE PROBLEMS

Communication line problems fall into three general categories: excessive noise, cabling, and backbone connections. With proper testing and precautions, these problems can be taken care of before they happen.

### EXCESSIVE NOISE

Noise is the term for random electrical signals that become part of a transmission, and that serve to make the signal (information) component of the transmission more difficult to identify. Noise can take various forms, including the following:

- Impulse noise: voltage increases that last for just a short period, usually for only a few milliseconds.
- White noise: random background noise.
- Crosstalk: interference on one wire from another.

There are limits set on the allowable levels for each of these types of noise. A noise filter can be used to remove random noise from a signal.

In a transmission, signal-to-noise ratio (SNR) is the ratio between the signal and noise levels at a given point, usually at the receiving end of the transmission. The SNR value is generally expressed in dB.

The SNR can be used to determine how long a cable segment can be before the signal loss is unacceptably high. The SNR also helps to determine whether a particular type of cable will work for the intended use. Cable testers can help determine whether a particular type of cable is appropriate in a specific environment.

In general, digital signals have a much higher SNR than analog signals. Because analog signals in a broadband network must be confined to a portion of the total bandwidth, filtering and other signal-cleaning measures are necessary. This confinement makes the signal more delicate and subject to distortion.

Several types of filtering maybe used to help clean a broadband transmission. The filters are distinguished by the filtering technique they use as well as by where in the transmission process they are applied.

For example, filters applied early in the transmission, prior to modulation, are known as baseband or premodulation filters. Those applied after the modulation are known as passband or postmodulation filters.

## CABLING

Cables are good media for signals, but they are not perfect. The signal at the end of the cable should be as loud and clear as at the beginning, but this will not be true.

Any transmission consists of signal and noise components. Even a digital signal degrades when transmitted over a wire. This is because the binary information must be converted to electrical form for transmission, and because the shape of the electrical signal changes over distance.

Signal quality degrades for several reasons, including attenuation, crosstalk, and impedance.

### **Attenuation**

Attenuation is the decrease in signal strength, measured in decibels (dB) per 100 feet. Such loss happens as the signal travels over the wire. Attenuation occurs more quickly at higher frequencies and when the cable's resistance is higher.

In networking environments, repeaters are responsible for cleaning and boosting a signal before passing it on. Many devices are repeaters without explicitly saying so. For example, each node in a token-ring network acts as a repeater. Since attenuation is sensitive to frequency, some situations require the use of equalizers to boost different-frequency signals the appropriate amount.

### **Crosstalk**

Crosstalk is interference in the form of a signal from a neighboring cable or circuit; for example, signals on different pairs of twisted wires in a twisted pair cable may interfere with each other. A commonly used measure of this interference in twisted-pair cable is near-end crosstalk (NEXT), which is represented in dB. The higher the dB value, the less crosstalk and the better is the cable.

Additional shielding between the carrier wire and the outside world is the most common way to decrease the effects of crosstalk.

### **Impedance**

Impedance, which is a measure of electrical resistance, is not directly a factor in a cable's performance. However, impedance can become a factor if it has different levels at different locations in a network. In order to minimize the disruptive effects of different impedances in a network, special devices, called baluns, are used to equalize impedance at the connection.

Impedance does reflect performance indirectly. The higher the impedance, the higher is the resistance; the higher the resistance, the greater is the attenuation at higher frequencies.

### **Line Conditioning**

Line conditioning tries to eliminate the effects of certain types of distortions on the signal. It becomes

more necessary as transmission speeds increase. Two types of line conditioning are available:

- C conditioning tries to minimize the effects of distortion related to signal amplitude and distortion due to envelope delay.
- D conditioning tries to minimize the effects of harmonic distortion in addition to the amplitude and envelope delay distortions handled by type C conditioning.

A line driver is a component that includes a transmitter and a receiver; it is used to extend the transmission range between devices that are connected directly to each other. In some cases a line driver can be used in place of a modem, for short distances of 10 miles or less.

To test a particular section of cable, you can use a line-testing tool. A line monitor is a low-end line-testing tool that tells you if the line is intact. A high-end line-testing tool can do very precise measurements using time domain reflectometry (TDR). A TDR is a device used to test the integrity of a section of cable before the cable is even unwound. This diagnostic method uses a signal of a known amplitude and duration, which is sent along a stretch of cable. Depending on the amount of time the signal takes to return and on the cable's nominal velocity of propagation, the TDR can determine the distance the signal traveled and whether there are any shorts or opens in the cable.

## **BACKBONE CONNECTIONS**

In addition to the inherent problems of the cabling, backbone connections add the problems that come with the use of connectors. They have only a limited number of times that they can be connected before they have to be replaced. These connectors are used in several places along the backbone, each presenting one more place for trouble to start. Some of the places that connectors are used are:

- At the server
- At the repeater, concentrator, and the gateway
- Along the backbone for each drop or tap
- At the splice and coupler (used with fiberoptic)

Each of the connections uses a different type of connector, each with its own limitations. For example:

- A vampire tap is a connector that uses two prongs to pierce the cable to make its connection. When it is used, one of the prongs can be bent and not make a proper connection.
- An RJ connector is the same type of connector used to plug your telephone into the wall. When it is used, the plastic clip has a tendency to break off the connector, resulting in the plug not locking in place.

## **SUMMARY**

In this chapter we discussed the how to troubleshoot communications line problems, network malfunctions, and how to test and evaluate the connection of networking system nodes. As with any troubleshooting, individual manufacturers of both hardware and software will have their own techniques to follow. What we have tried to do is give you a brief overview of the type of trouble that you can expect to run into and some basics as how to begin the troubleshooting.





## APPENDIX I

# GLOSSARY

### A

**ATTENUATION**— Loss of communication signal energy.

### B

**BASEBAND**— The frequency band occupied by individual information bearing signals before they are combined with a carrier in the modulation process.

**BISYNC**— Controlling of data transmission by timing signals generated at the sending and receiving stations.

**BROADBAND**— Transmission facilities whose bandwidth is greater than that available on voice-grade facilities.

**BUS**— Channel or path for transferring data and electrical signals.

### C

**CARRIER SENSE MULTIPLE ACCESS (CSMA)**— A protocol that controls access to a network's bus.

**CARRIER SENSE MULTIPLE ACCESS WITH COLLISION AVOIDANCE (CSMA/CA)**— A protocol that requires carrier sense and in which a data station that intends to transmit sends a jam signal.

**CARRIER SENSE MULTIPLE ACCESS WITH COLLISION DETECTION (CSMA/CD)**— A protocol that requires carrier sense and in which a transmitting data station that detects another signal while transmitting, stops sending, sends a jam signal, and then waits for a variable time before trying again.

**CLEAR TO SEND**— A hardware signal sent from a receiver to a transmitter to indicate that the transmitter can begin sending.

**CROSSTALK**— The disturbance caused in a circuit by an unwanted transfer of energy from another circuit.

### F

**FILTER**— A device or program that separates data, signals, or material in accordance with specified criteria.

**FIREWALL**— One or more components that control the flow of network traffic between networks.

### H

**HANDSHAKING**— The process through which the rules for exchanging data over a communications line are defined for the two devices involved.

### I

**IMPEDANCE**— A measure of electrical resistance.

**INTERNATIONAL STANDARDS ORGANIZATION (ISO)**— The international agency responsible for developing standards for information exchange.

**INTERRUPT REQUEST LINES**— Physical connections between hardware devices and the interrupt request.

### L

**LINE DRIVER**— A component that includes a transmitter and a receiver.

**LINK**— The communications media used to connect nodes.

### M

**MULTITASKING**— A mode of operation that provides for concurrent performance of two or more tasks.

### N

**NETWORK INTERFACE CARD (NIC)**— The expansion card that allows the workstation to communicate with the network.

**NETWORK OPERATING SYSTEM (NOS)**— A software package that makes it possible to implement and control a network and that enables users to make use of resources and services on that network.

**NODE**— The point at the end of a branch.

**NOISE**— Random electrical signals that become part of a transmission, and that serve to make the signal (information) component of the transmission more difficult to identify.

## O

**OPEN SYSTEMS INTERCONNECTION (OSI)**— The networking standard for interconnecting dissimilar computer systems.

## P

**PROTOCOL**— A formal set of conventions governing the format and control of inputs and outputs between two communicating processes.

## R

**READY TO SEND**— A hardware signal sent from a potential transmitter to a destination to indicate that the transmitter wishes to begin a transmission.

## S

**SYNCHRONOUS DATA LINK CONTROL (SDLC)**— Primary protocol supported under System Network Architecture (SNA).

**SIGNAL-TO-NOISE RATIO (SNR)**— The ratio between the signal and noise levels at a given point, usually at the receiving end of the transmission.

## T

**TIME DOMAIN REFLECTOMETER**— A device used to test the integrity of a section of cable.

**TOPOLOGY**— The physical or logical layout of a LAN.

## APPENDIX II

# GLOSSARY OF ACRONYMS AND ABBREVIATIONS

<b>A</b>	<b>I</b>
<b>AWG</b> — American wire gauge.	<b>IP</b> — Internet protocol.
<b>B</b>	<b>IRQ</b> — Interrupt request line.
<b>Bisync</b> — Binary synchronous communications protocol.	<b>ISO</b> — International Standards Organization.
<b>BNC</b> — Barrel nut connector.	<b>L</b>
<b>bps</b> — Bits per second.	<b>LAN</b> — Local area network
<b>C</b>	<b>LED</b> — Light-emitting diode.
<b>CAD</b> — Computer aided design.	<b>M</b>
<b>CODEC</b> — Coder/decoder.	<b>MAN</b> — Metropolitan area network.
<b>CSMA</b> — Carrier sense multiple access.	<b>MAU</b> — Multistation access unit.
<b>CSMA/CA</b> — Carrier sense multiple access with collision avoidance.	<b>Mbps</b> — Megabits per second.
<b>CSMA/CD</b> — Carrier sense multiple access with collision detection.	<b>MIC</b> — Medium interface connector.
<b>CTS</b> — Clear to send.	<b>MODEM</b> — Modulator-demodulator.
<b>D</b>	<b>N</b>
<b>dB</b> — Decibel.	<b>NEXT</b> — Near-end crosstalk.
<b>E</b>	<b>NIC</b> — Network interface card.
<b>EIA/TIA</b> — Electronics Industries Association/ Telecommunications Industry Association.	<b>NOS</b> — Network operating system.
<b>F</b>	<b>O</b>
<b>FSCK</b> — Filesystem check.	<b>OSI</b> — Open systems interconnection.
<b>FTP</b> — File transfer protocol.	<b>P</b>
<b>G</b>	<b>POST</b> — Power-on self test.
<b>Gbps</b> — Gigabits per second.	<b>R</b>
<b>H</b>	<b>RJ</b> — Registered jack.
<b>HTTP</b> — Hypertext transfer protocol.	<b>ROM</b> — Read-only memory.
	<b>RTS</b> — Ready to send.
	<b>S</b>
	<b>SC</b> — Subscriber connector.
	<b>SDLC</b> — Synchronous data link control.
	<b>SMA</b> — Sub-miniature assembly.

**SNR**— Signal-to-noise ratio.

**ST**— Straight tip.

**STP**— Shielded twisted pair.

## **T**

**TCP**— Transmission control protocol.

**TDR**— Time domain reflectometer.

**TELNET**— Telecommunications network.

## **U**

**UDP**— User datagram protocol.

**UTP**— Unshielded twisted pair.

## **W**

**WAN**— Wide area network.

## APPENDIX III

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# **RADIOMAN TRAINING SERIES**

## **MODULE 3 - NETWORK COMMUNICATIONS**

**NAVEDTRA 12847**

Prepared by the Naval Education and Training Professional Development and Technology Center (NETPDTC), Pensacola, Florida

Congratulations! By enrolling in this course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement. Keep up the good work.

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### **HOW TO COMPLETE THIS COURSE SUCCESSFULLY**

**ERRATA:** If an errata comes with this course, make all indicated changes or corrections before you start any assignment. Do not change or correct the associated text or assignments in any other way.

**TEXTBOOK ASSIGNMENTS:** The text pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions in the course. Pay close attention to tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

**SELECTING YOUR ANSWERS:** After studying the associated text, you should be ready to answer the questions in the assignment. Read each question carefully, then select the BEST answer. Be sure to select your answer from the subject matter in the text. You may refer freely to the text and seek advice and

information from others on problems that may arise in the course. However, the answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

**ANSWER SHEETS:** You must use answer sheets designed for this course (NETPMSA Form 1430/5, Stock Ordering Number 0502-LP-216-0100). Use the answer sheets provided by Educational Services Officer (ESO), or you may reproduce the one in the back of this course booklet.

**SUBMITTING COMPLETED ANSWER SHEETS:** As a minimum, you should complete at least one assignment per month. Failure to meet this requirement could result in disenrollment from the course. As you complete each assignment, submit the completed answer sheet to your ESO for grading. You may submit more than one answer sheet at a time.

**GRADING:** Your ESO will grade each answer sheet and notify you of any incorrect answers. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, your ESO will list the questions you answered incorrectly

and give you an answer sheet marked "RESUBMIT." You must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

COURSE COMPLETION: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment. your command should give you credit for this course by making the appropriate entry in your service record.

NAVAL RESERVE RETIREMENT CREDIT: If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 3 points. (Refer to BUPERSINST 1001.39 for more information about retirement points.)

STUDENT QUESTIONS: If you have questions concerning the administration of this course, consult your ESO. If you have questions on course content, you may contact NETPDTC at:

DSN: 922-1501  
Commercial: (904) 452-1501  
FAX: 922-1819  
INTERNET:  
n311.products@smtp.cnet.navy.mil

COURSE OBJECTIVES: In completing this nonresident training course, you will demonstrate a knowledge of the subject matter by correctly answering questions on the following subjects:

Network Administration, LAN Hardware,  
and Network Troubleshooting.

Naval courses may include several types of questions--multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. You can readily identify the type of each question, and the action required, by reviewing of the samples given below.

MULTIPLE-CHOICE QUESTIONS

Each question contains several alternative answers, one of which is the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

- s-1. The first U.S. Navy nuclear-powered vessel was what type of ship?
- 1. Carrier
  - 2. Submarine
  - 3. Destroyer
  - 4. Cruiser

Indicate in this way on your answer sheet:

	1	2	3	4
	T	F		
s-1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

TRUE-FALSE QUESTIONS

Mark each statement true or false as indicated below. If any part of the statement is false, the entire statement is false. Make your decision, and blacken the appropriate box on the answer sheet.

SAMPLE

- s-2. Shock will never be serious enough to cause death.
- 1. True
  - 2. False

Indicate in this way on your answer sheet:

	1	2	3	4
	T	F		
s-2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

MATCHING QUESTIONS

Each set of questions consists of two columns, each listing words, phrases or sentences. Your task is to select the item in column B which is the best match for the item in column A. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on your answer sheet.

SAMPLE

In answering questions s-3 through s-6, SELECT from column B the department where the shipboard officer in column A functions. Responses may be used once, more than once, or not at all.

- |                               |                           |
|-------------------------------|---------------------------|
| A. OFFICER                    | B. DEPARTMENT             |
| s-3. Damage Control Assistant | 1. Operations Department  |
| s-4. CIC Officer              | 2. Engineering Department |
| s-5. Disbursing Officer       | 3. Supply Department      |
| s-6. Communications Officer   | 4. Navigation Department  |

Indicate in this way on your answer sheet:

	1	2	3	4
	T	F		
s-3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _
s-4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _
s-5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> _ _ _
s-6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _



# ASSIGNMENT 1

Textbook Assignment: "Network Administration," chapter 1, pages 1-1 through 1-19.

---

- 1-1. Networking gives an individual the capability to communicate and connect with another individual or another system in order to accomplish which of the following tasks?
1. Send messages
  2. Share resources
  3. Extend processing
  4. Perform multiprocessing
- 1-2. Which of the following types of cables is NOT used for communications?
1. Coaxial
  2. Fiber optic
  3. Solid core
  4. Twisted-pair
- 1-3. Login procedures that are accomplished by dialing into an access server are known by which of the following terms?
1. Dialup access
  2. Distance access
  3. Extended access
  4. Remote access
- 1-4. The first thing that the initialization program checks is which of the following areas?
1. Connections
  2. Memory
  3. Peripherals
  4. User accounts
- 1-5. What is the function of the kernel?
1. Establishes communications
  2. Initializes the system
  3. Mounts and initializes system files
  4. Verifies the integrity of the root filesystem
- 1-6. How many primary modes of system operation are there?
1. One
  2. Two
  3. Three
  4. Four
- 1-7. Rebooting the system is called for in how many common situations?
1. Five
  2. Two
  3. Six
  4. Four
- 1-8. When shutting down the system, turning off the power to the CPU is recommended under which of the following times or conditions?
1. End of the day
  2. End of the week
  3. Normal conditions
  4. Emergency conditions

- 1-9. Which of the following is NOT a reason why you should monitor the network?
1. To enable you to tune your network
  2. To establish communications
  3. To maintain a performance history
  4. To provide a statistical basis for equipment purchases
- 1-10. The main importance of reviewing audit/event logs is which of the following functions?
1. Check system throughput
  2. Monitor system degradation
  3. Monitor system security
  4. Verify password attempts
- 1-11. By using the audit logs, a network administrator can track which of the following areas?
1. Which files were accessed
  2. When files were accessed
  3. Who accessed certain files
  4. Each of the above
- 1-12. How many interrupt request lines (IRQs) are there in a PC environment?
1. 14
  2. 16
  3. 18
  4. 20
- 1-13. IRQ values for a device may be set through software or manually by which of the following ways?
1. DIP switches
  2. Expansion slot
  3. Type of cable used
  4. Order in which device was installed
- 1-14. Network performance is governed by which of the following areas?
1. Administration
  2. Hardware
  3. Software
  4. Both 2 and 3 above
- 1-15. Besides a physical interface between the device and the computer, what other type of interface does a port provide?
1. Electrical
  2. Logical
  3. Parallel
  4. Transfer
- 1-16. Which of the following terms is used to describe the process used by an application to test a remote device?
1. Pinging
  2. Ringing
  3. Signaling
  4. Sounding



- 1-17. The interface between the telecommunications access software and the application programs is known by which of the following terms?
1. Network operating system
  2. Network system software
  3. Telecommunications access software
  4. Teleprocessing monitor
- 1-18. Electronic mail is classified as what type of software program?
1. Communications
  2. Utility
  3. Network access
  4. Network operating
- 1-19. Which of the following terms describes the prevention of files from being updated by more than one user at a time?
1. Data integrity
  2. Data validity
  3. System access
  4. System security
- 1-20. The different levels of access can be designated by which of the following terms?
1. Private
  2. Public
  3. Shared
  4. Each of the above
- 1-21. Network software often provides some type of locking capability. This locking feature prevents which of the following actions?
1. Access to the file while it is being worked on
  2. Logging onto more than one workstation at a time
  3. Security violations from occurring
  4. Unauthorized users from logging onto the network
- 1-22. Once the software is installed on the network, it must be tested.
1. True
  2. False
- 1-23. How many methods are used to provide service restoration after system degradation?
1. Five
  2. Two
  3. Three
  4. Four
- 1-24. Which of the following factors does not contribute to the flexibility of a network?
1. Cabling
  2. Protocol
  3. Topology
  4. Network system software

- 1-25. What is the minimum percentage to be used in calculating the available resources for the network?
1. 10
  2. 15
  3. 20
  4. 25
- 1-26. How many major types of LAN configurations are there?
1. Five
  2. Six
  3. Three
  4. Four
- 1-27. Which of the following topologies was the earliest type?
1. Bus
  2. Ring
  3. Star
  4. Distributed
- 1-28. Which of the following topologies permits centralized diagnostics of all functions?
1. Bus
  2. Ring
  3. Star
  4. Distributed
- 1-29. Which of the following topologies is used in many low-cost LANs?
1. Bus
  2. Ring
  3. Star
  4. Distributed
- 1-30. Which of the following topologies normally requires the entire network be brought down to add a new node?
1. Bus
  2. Ring
  3. Star
  4. Distributed
- 1-31. Which of the following topologies can be easily adapted to the physical arrangement of the facility site?
1. Bus
  2. Ring
  3. Star
  4. Distributed
- 1-32. Which of the following protocols is/are used-to control line discipline?
1. Asynchronous data control
  2. Binary synchronous communications
  3. Synchronous data link control
  4. Both 2 and 3 above
- 1-33. The access method that will be used is governed primarily by which of the following factors?
1. Protocol
  2. Topology
  3. Both 1 and 2
  4. Network operating system

- 1-34. Using the token passing access method, what, if anything, happens when the transmitting station receives the same token?
1. The message is being sent
  2. The message has been passed around the network
  3. The message has been appended by another station
  4. Nothing
- 1-35. How many layers are there in the OSI reference model?
1. Five
  2. Six
  3. Seven
  4. Eight
- 1-36. The physical layer is which layer number of the OSI reference model?
1. One
  2. Two
  3. Three
  4. Four
- 1-37. Which layer provides error-free transmission of information over the physical medium?
1. Data link
  2. Network
  3. Physical
  4. Transport
- 1-38. The network layer is which layer number of the OSI reference model?
1. One
  2. Two
  3. Three
  4. Four
- 1-39. The transport layer is which layer number of the OSI reference model?
1. Five
  2. Two
  3. Three
  4. Four
- 1-40. Which layer ensures data units are delivered error-free, in sequence, with no losses or duplications?
1. Network
  2. Presentation
  3. Session
  4. Transport
- 1-41. Which layer performs the functions that enable two applications to communicate across the network?
1. Network
  2. Presentation
  3. Session
  4. Transport
- 1-42. Which layer formats data to be presented to the application layer?
1. Network
  2. Presentation
  3. Session
  4. Transport

- 1-43. Which layer represents the services that directly support users?
1. Application
  2. Network
  3. Physical
  4. Session
- 1-44. Which of the following cable types is the least expensive?
1. Coaxial
  2. Fiber optic
  3. Solid core
  4. Twisted-pair
- 1-45. For network purposes, 22- and 24-gauge wire are the most common types of which of the following types of cables?
1. Coaxial
  2. Fiber optic
  3. Solid core
  4. Twisted-pair
- 1-46. Which of the following types of cable can handle a data flow of up to approximately one Mbps?
1. Coaxial
  2. Fiber optic
  3. Solid core
  4. Twisted-pair
- 1-47. Coaxial cable is used extensively in LANs whenever the distance involved is relatively short, generally less than how many miles (a) for baseband and (b) for broadband?
1. (a) 1 (b) 5
  2. (a) 2 (b) 5
  3. (a) 2 (b) 10
  4. (a) 5 (b) 10
- 1-48. Fiber optic cable has a transmission rate that ranges up to approximately what speed?
1. 1 Gbps
  2. 3 Gbps
  3. 5 Gbps
  4. 7 Gbps
- 1-49. Why is fiber optic cable immune to electrical interference of any kind?
1. Has only one strand per cable
  2. Has thick shielding
  3. Carries no electrical current
  4. Uses double insulation on each wire
- 1-50. What software package makes it possible to implement and control a network and enables users to use the resources and services on the network?
1. Network application software
  2. Network operating software
  3. Network system software
  4. Telecommunications access software

1-51. Firewalls can be divided into how many different categories?

1. Five
2. Two
3. Three
4. Four

1-52. What piece of hardware is typically used to implement packet filtering?

1. Bridge
2. Gateway
3. Hub
4. Router

1-53. Which of the following features can be provided by a firewall?

1. Address translation
2. Authentication
3. Virtual private networks
4. All of the above

# ASSIGNMENT 2

Textbook Assignment: "LAN Hardware," chapter 2, pages 2-1 through 2-10;  
"Network Troubleshooting," chapter 3, pages 3-1  
through 3-7.

---

- |   |  |
|---|--|
| <p>2-1. Which of the following devices is used to amplify electrical signals carried by the network?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Gateway</li><li>3. Repeater</li><li>4. Router</li></ol> | <p>2-6. Which of the following devices serves as a termination point for a cable running from individual nodes in a network?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Concentrator</li><li>3. Gateway</li><li>4. Hub</li></ol>                       |
| <p>2-2. Which of the following devices is used to connect identical network segments?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Gateway</li><li>3. Repeater</li><li>4. Router</li></ol>                | <p>2-7. Which of the following devices is a box with a number of connectors to which multiple nodes are attached?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Concentrator</li><li>3. Gateway</li><li>4. Hub</li></ol>                                  |
| <p>2-3. Which of the following devices handles the first two layers of the OSI model?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Gateway</li><li>3. Repeater</li><li>4. Router</li></ol>                | <p>2-8. Which of the following factors need to be decided on before determining the type of connector to use?</p> <ol style="list-style-type: none"><li>1. Architecture only</li><li>2. Cable only</li><li>3. Both architecture and cable</li><li>4. Environment</li></ol> |
| <p>2-4. Which of the following devices works at the third layer of the OSI model?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Gateway</li><li>3. Repeater</li><li>4. Router</li></ol>                    | <p>2-9. Which of the following cables is the best choice if a secure network is needed?</p> <ol style="list-style-type: none"><li>1. Coaxial</li><li>2. Fiber optic</li><li>3. Solid core</li><li>4. Twisted-pair</li></ol>  |
| <p>2-5. Which of the following devices works at layer seven of the OSI model?</p> <ol style="list-style-type: none"><li>1. Bridge</li><li>2. Gateway</li><li>3. Repeater</li><li>4. Router</li></ol>                        |  |

- 2-10. Which of the following cables is identified by a designation number of RG-11?
1. Coaxial
  2. Fiber optic
  3. Solid core
  4. Twisted-pair
- 2-11. Which of the following signals is NOT supported by a broadband system?
1. Data
  2. Digital
  3. Video
  4. Voice
- 2-12. What type of connector is used to link two segments of cable in a straight run?
1. Barrel
  2. Elbow
  3. RJ
  4. T
- 2-13. What type of connector is used to connect telephones to the wall?
1. Barrel
  2. Elbow
  3. RJ
  4. T
- 2-14. An ST connector is rated for what number of matings?
1. 200
  2. 500
  3. 800
  4. 1000
- 2-15. An SC connector is rated for what number of matings?
1. 200
  2. 500
  3. 800
  4. 1000
- 2-16. An SMA connector is rated for what number of matings?
1. 200
  2. 500
  3. 800
  4. 1000
- 2-17. Fiber optic connectors differ from other connectors in which of the following ways?
1. Size of the ferrule
  2. Keyed connector
  3. The number of matings
  4. All of the above
- 2-18. Components should be tested at all but which of the following times?
1. Before they are installed
  2. During the installation
  3. After they are installed
  4. When things go wrong
- 2-19. To test electrical activity, you will need which of the following pieces of test equipment?
1. Armature
  2. Calibrator
  3. Conditioner
  4. Voltmeter
- 2-20. Which of the following pieces of test equipment should be used to check for faults in a cable?
1. Calibrator
  2. Conditioner
  3. Scanner
  4. Voltmeter
- 2-21. What term refers to the cable that forms the main trunk of a network?
1. Backbone
  2. Main link
  3. Node drop
  4. Primary run

- 2-22. What type of cable is a 100-ohm, multipair cable used for voice grade communications?
1. Coaxial
  2. Fiber optic
  3. STP
  4. UTP
- 2-23. How many types of backbone cable are there?
1. One
  2. Two
  3. Three
  4. Four
- 2-24. What cable manages the bulk of the traffic on a network?
1. Backbone
  2. Main link
  3. Node drop
  4. Primary run
- 2-25. What device mediates between the computer and the network by doing the necessary processing and translation to enable users to send or receive commands and data over the network?
1. Network access card
  2. Network interface card
  3. Network operations card
  4. Network union card
- 2-26. Which of the following equipment is used to attach cable sections to each other?
1. Concentrators
  2. Repeaters
  3. Terminators
  4. Transceivers
- 2-27. Which of the following equipment is used to absorb a transmission at the end of a network?
1. Concentrators
  2. Repeaters
  3. Terminators
  4. Transceivers
- 2-28. Which of the following is NOT a category of network problems?
1. Commware
  2. Hardware
  3. Peopleware
  4. Software
- 2-29. Which of the following is NOT a specialized diagnostic tool?
1. Breakout box
  2. Datascope
  3. Time domain reflectometer
  4. Voltmeter
- 2-30. Which of the following areas cause the majority of all network-related problems?
1. Cabling failures
  2. Operating system failures
  3. Power outages
  4. User actions
- 2-31. To determine the problem, which of the following information should be gathered?
1. Nature of the problem
  2. Node identification number
  3. User's name
  4. All of the above



- 2-32. How many primary culprits are there to network malfunctions?
1. Five
  2. Two
  3. Three
  4. Four
- 2-33. Component failures are categorized into which of the following types of faults?
1. Hard and soft
  2. Hard and permanent
  3. Soft and temporary
  4. Permanent and temporary
- 2-34. PC tests are stored in ROM, are known by which of following terms?
1. Boot test
  2. Pre-startup test
  3. Power-on self test
  4. Start test
- 2-35. Which of the following pieces of test equipment is the best tool to use for network malfunctions?
1. Line conditioner
  2. Network analyzer
  3. Time domain reflectometer
  4. Voltmeter
- 2-36. When a network malfunction is detected, the alarm is sent to which of the following persons?
1. Department head
  2. Network supervisor
  3. Security officer
  4. User
- 2-37. To reestablish services, which of the following steps is the first and easiest to try?
1. Run the system distribution
  2. Run the system initialization command
  3. Shutdown and reboot the system
  4. Verify the domain name
- 2-38. Which of the following terms is used to describe what occurs when two nodes start transmitting at the same time?
1. Collision
  2. Derail
  3. Jam
  4. Wreck
- 2-39. When a node needs to send data, it waits until the line is quiet and then transmits. This protocol is known by what term?
1. CSMA/CA
  2. CSMA/CB
  3. CSMA/CD
  4. CSMA/CE
- 2-40. In a CSMA/CA system, the media-access method uses which of the following signals before sending a frame onto the network?
1. NTS and CTS
  2. RTS and CTS
  3. WTS and NTS
  4. WTS and RTS

- 2-41. Which of the following terms is described as a hardware signal sent from a potential transmitter to a destination to indicate that the transmitter wishes to begin a transmission?
1. BTS
  2. NTS
  3. RTS
  4. WTS
- 2-42. Whether the cable is pre-made or you make it, it should always be tested before it is installed.
1. True
  2. False
- 2-43. Communication line problems fall into how many different categories?
1. Five
  2. Two
  3. Three
  4. Four
- 2-44. Which of the following terms is not a form of noise?
1. Blocktalk
  2. Crosstalk
  3. Impulse
  4. White
- 2-45. Which of the following ratios is used to determine how long a cable segment can be before the signal loss is unacceptably high?
1. NER
  2. NNR
  3. SER
  4. SNR
- 2-46. Filters applied early in the transmission are known by which of the following terms?
1. Baseband
  2. Broadband
  3. Passband
  4. Preband
- 2-47. Which of the following terms is used to describe the decrease in signal strength measured in decibels per 100 feet?
1. Crosstalk
  2. Impedance
  3. Attenuation
  4. Degradation
- 2-48. A commonly used measure of interference in twisted-pair cable is referred to by which of the following names?
1. Front-end crosstalk
  2. Inter-end crosstalk
  3. Mid-to-end crosstalk
  4. Near-end crosstalk
- 2-49. Which of the following terms is a measure of electrical resistance?
1. Crosstalk
  2. Impedance
  3. Attenuation
  4. Degradation
- 2-50. How many types of line conditioning are available?
1. Five
  2. Two
  3. Three
  4. Four

2-51. Which of the following equipment is used to extend the transmission range between devices that are connected directly to each other?

1. Line conditioner
2. Line driver
3. Network analyzer
4. Time domain reflectometer



## STUDENT COMMENT SHEET

THIS FORM MAY BE USED TO SUGGEST IMPROVEMENTS, REPORT COURSE ERRORS, OR TO REQUEST HELP IF YOU HAVE DIFFICULTY COMPLETING THE COURSE.

**NOTE: IF YOU HAVE NO COMMENTS, YOU DO NOT HAVE TO SUBMIT THIS FORM.**

FROM: \_\_\_\_\_ Date\_\_\_\_\_

\_\_\_\_\_  
RATE/RANK/GRADE, NAME (FIRST, M.I., LAST)

\_\_\_\_\_  
STREET ADDRESS, APT #

\_\_\_\_\_  
CITY, STATE, ZIP CODE

DSN: \_\_\_\_\_

Commercial: \_\_\_\_\_

FAX: \_\_\_\_\_

INTERNET: \_\_\_\_\_

To: COMMANDING OFFICER  
NETPDTC CODE N311  
6490 SAUFLEY FIELD RD  
PENSACOLA FL 32509-5237

Subj: RADIOMAN TRAINING SERIES, MODULE 3- NETWORK COMMUNICATIONS,  
NAVEDTRA 12847

1. The following comments are hereby submitted:

## PRIVACY ACT STATEMENT

UNDER AUTHORITY OF TITLE 5, USC 301, INFORMATION REGARDING YOUR MILITARY STATUS IS REQUESTED TO ASSIST IN PROCESSING YOUR COMMENTS AND IN PREPARING A REPLY. THIS INFORMATION WILL NOT BE DIVULGED WITHOUT WRITTEN AUTHORIZATION TO ANYONE OTHER THAN THOSE WITHIN DOD FOR OFFICIAL USE IN DETERMINING PERFORMANCE.

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## **DEPARTMENT OF THE NAVY**

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COMMANDING OFFICER  
NETPDTC CODE N311  
6490 SAUFLEY FIELD RD  
PENSACOLA FL 32509-5237

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**OFFICIAL BUSINESS**

**COMMANDING OFFICER  
NETPDTC CODE N311  
6490 SAUFLEY FIELD RD  
PENSACOLA FL 32509-5237**

PRINT OR TYPE

TITLE \_\_\_\_\_ NAVEDTRA \_\_\_\_\_

NAME \_\_\_\_\_ ADDRESS \_\_\_\_\_  
                     Last                      First                      Middle                      Street/Ship/Unit/Division, etc.

City or FPO \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

RANK/RATE \_\_\_\_\_ SSN \_\_\_\_\_ DESIGNATOR \_\_\_\_\_ ASSIGNMENT NO. \_\_\_\_\_ DATE SUBMITTED \_\_\_\_\_

☐ USN   ☐ USNR   ☐ ACTIVE   ☐ INACTIVE   OTHER (Specify) \_\_\_\_\_

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